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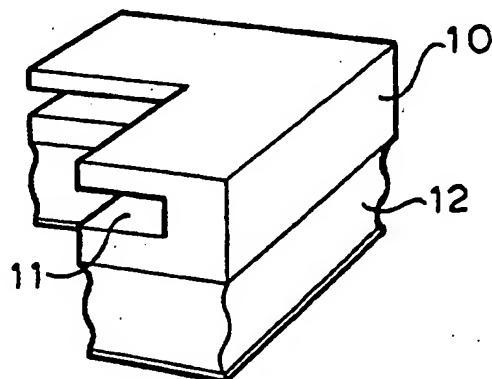
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(54) Title: IMPROVEMENTS IN OR RELATING TO SUPPORT DEVICES

(57) Abstract

A support device has a support element (10) having means (12) for enabling securement to a surface by suction and which is formed (11) to receive the edge of a panel. There are various ways in which suction can be induced and the principles are applicable not only to the support of panels.



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IMPROVEMENTS IN OR RELATING TO SUPPORT DEVICES

This invention relates to support devices and more particularly but not exclusively to a panel support device for securing a panel such as an advertising board or paper
5 sheet to a surface such as a window or wall.

According to one aspect of the invention there is provided a panel support device comprising a support element having means for enabling securement to a surface by suction, which element is formed to receive the edge of a
10 panel.

The support device may be elongate and have an elongate formation to receive the edge of a panel.

The support device may have an "L" shaped formation for receiving the corner of a rectangular panel. The support
15 device may itself be corner shaped for example "rounded" corner or "L" shaped and the formation to receive the edge of the panel may extend along both arms of the corner or "L".

The support device may be in the form of a frame for
20 surrounding and securing a panel.

The formation may be a groove or a slit into which

the edge of a panel can be inserted. The walls of the slit or groove may be resilient to permit securement of a panel therebetween by a resilient clamping action. Alternatively, the formation may be a projecting web enabling retention of
5 a panel between the web and a surface. The web may be resilient to permit securement of a panel between a surface and the web by a resilient clamping action.

The means for securement may comprise one or more resilient suckers. In the case of an elongate rectangular
10 support element a resilient wall may be provided defining the perimeter of the element and forming a rectangular sucker. In the case of an "L" shaped device a resilient wall may be provided defining the perimeter of the element and forming an "L" shaped sucker.

15 In the case of the support device being a frame, a resilient wall may be provided both along the outer perimeter and along the inner perimeter of the frame to form a sucker therebetween. The rectangular, "L" shaped or frame shaped sucker may be provided with one or more resilient
20 partitions thereby to define a plurality of suckers within perimeter or perimeters of the element.

The resilient wall and where provided the partitions, may be provided with a sealing surface formed from silicon rubber. The entire resilient wall/partitioning
25 may be formed from silicon rubber.

In order to enhance the suction capability of the sucker there may be provided a non return valve communicating with the sucker cavity of the or at least one

of the suckers which permits expulsion of air from the or each cavity but which prevents return therethrough. The valve may be provided with opening means to permit return of air to the or said at least one of the suction cavities.

5 Instead of employing a resilient wall defining a cavity one or more rigid or semi-rigid walls may be employed to define a suction cavity there being provided a passageway communicating through the element to the cavity and a non return valve in the passageway permitting in use the
10 extraction of air from the cavity.

 The invention also includes a panel display apparatus, comprising four support devices having "L" shaped formations for receiving the corner of a rectangular panel which support devices are as hereinbefore defined and a
15 panel to which the support devices can be engaged to effect securement to a surface. The panel display apparatus may include one or more elongate support devices as hereinbefore defined for engagement intermediately of the corners of the panel to enhance securement of the panel to a surface.

20 According to another aspect of the invention there is provided a support device for effecting securement by suction in accordance with any of the means described herein.

 In order that the invention and its various other
25 preferred features may be understood more easily, some embodiments relating to panel support devices will now be described, by way of example only, with reference to the drawings, in which:-

Figure 1 is a perspective elevation of an "L" shaped panel support device constructed in accordance with the invention,

Figure 2 is an end elevational view of the panel support device of Figure 1,

Figure 3 is an underside view of the panel support device of Figures 1 and 2,

Figure 4 is a cross sectional view taken transversely of one arm of an "L" shaped corner device similar to that of Figures 1 to 3 showing an enhanced sealing arrangement,

Figure 5 is an enlargement of the encircled portion shown in Figure 4 to illustrate additional detail,

Figure 6 is a cross sectional view taken transversely of one arm of an "L" shaped corner panel support device constructed in accordance with the invention and incorporating an extending web or lip,

Figure 7 is an underside view of the device of Figure 6,

Figure 8 is an underside view of an "L" shaped panel support device showing an alternative construction in accordance with the invention,

Figure 9 is an underside view of part of a panel support device showing details of an alternative seal of honeycomb formation,

Figure 10 is an underside view of part of a panel support device showing detail of an alternative seal formed with mini suction pads,

Figure 11 is an underside view of part of a panel support device showing detail of an alternative seal formed with micro suction pads,

Figure 12 is a cross sectional view of a panel support device with alternative means for providing enhanced sealing,

Figure 13 is a cross sectional view of an alternative construction of panel support device in which there is enhanced cavity capacity,

Figure 14 is a cross sectional view of part of another alternative construction of panel support device in which there is enhanced suction,

Figure 15 is a cross sectional view of a panel support device in which the suction chamber has a non return valve,

Figure 16 is a side elevation of the panel support device of Figure 13,

Figure 17a and 17b are cross-sectional views of another panel support device constructed in accordance with the invention,

Figure 17c is an exploded cross sectional view of a panel support device employing the principles illustrated in Figure 17a and 17b,

Figure 18 is a cross sectional assembled view of the device of Figure 18 shown in the operated condition,

Figure 20 is a cross sectional view similar to the construction illustrated in Figure 17 but employing a diaphragm,

Figure 21 is a perspective view of a panel support device showing in broken lines internal details of a piston and cylinder arrangement for inducing suction,

Figure 22 is a side view of the device of Figure 21
5 taken along the line x-x, again showing internal detail in broken lines,

Figure 23 is a cross sectional view taken transversely of one arm of an "L" shaped corner device similar to Figures 1 to 3 but having a slit for receiving a
10 thin panel,

Figure 24 is a partial side view of the device of Figure 23,

Figure 25 is a side view of an elongate panel support device constructed in accordance with the invention,

15 Figure 26 is an underside view of the device of Figure 25,

Figure 27 is a rear view of a panel support device constructed in the form of a frame,

Figure 28 is an elevational view partly in cross
20 sectional of an alternative construction of a panel support device constructed in accordance with the invention,

Figure 29 is an underside view of the panel support device of Figure 28,

Figure 30 is a top view of the panel support device
25 of Figure 28 to a reduced scale,

Figure 31 is a cross sectional view taken along the section line X-X in Figure 30

Figure 32 is a perspective view of the panel support

device of Figures 28 to 31,

Figures 33 a to i illustrate some possible alternative cross sectional appearances of panel support devices constructed in accordance with the invention,

5 Figure 34 is a plan view of a panel display apparatus constructed in accordance with the invention employing corner panel support devices,

Figure 35 is a plan view of an alternative panel display apparatus constructed in accordance with the
10 invention and employed elongate panel support devices,

Figure 36 is a plan view of another alternative panel display apparatus constructed in accordance with the invention employing both corner and elongate panel support devices, and

15 Figure 37 is a plan view of yet another alternative panel display apparatus constructed in accordance with the invention and employing a panel support device of frame configuration.

The "L" shaped panel support device of Figures 1 to
20 3 is formed from a resilient material e.g. synthetic rubber and comprises an "L" shaped corner piece 10 having arms which are substantially rectangular in cross section their inside edges having a groove 11 of rectangular cross section which extends the full length of both of the arms. The
25 lower face of the corner piece has a downwardly extending resilient skirt 12 which extends around the perimeter of the "L" and defines a cavity 13. The cavity defines a sucker such that if the base of the skirt is placed against a

surface and air is expelled between the surface and the base of the skirt by depression of the skirt then the support device is secured to the surface by suction provided of course that the skirt maintains a seal with the surface. An enhanced seal can be effected by providing the edge of the skirt with a layer of silicon rubber which may be provided with ribs which circumvent the skirt to provide a number of sealing edges to take up irregularities in the surface.

Referring now to Figure 4 and 5 there is shown in cross section a modification to the base of the skirt 12 to enhance the sealing capability. As will be seen more easily from the enlarged detail of Figure 5 the base of the skirt has a channel 14 in which there is provided a seal 15 of highly resilient material for example silicon rubber the sealing face of which is ribbed such that the individual ribs 16 extend continuously around the skirt and define individual sealing edges. In this way failure of one of the sealing edges due to damage or due to surface imperfection will not result in complete failure of the seal.

In the embodiment illustrated in Figures 6 and 7 an alternative formation for receiving the edge of a panel is provided. In this case there is provided a projecting web or lip 17 instead of the groove which when in use serves to overlap the edge of a panel and secure the panel between the web or lip and the surface to which the panel is to be secured. The projecting web or lip may be resilient and may be arranged to secure the panel flush against the surface or may provide a gap in which the panel is contained.

The panel support device of Figure 8 is again "L" shaped and in this case has somewhat longer arms and a rounded corner. The skirt 20 which extends around the perimeter of the seal to define a sucker is provided with a number of partitions 21 which extend from top to bottom of the cavity defined by the skirt and form individual sucker cavities 22. It will be appreciated that this enhances the reliability of the securement to a surface as failure of sealing of one sucker cavity will not cause overall failure of securement.

By appropriate moulding of the base of the skirt, or the seal provided on the base of the skirt, the suitability for adhesion to different types of surfaces can be accommodated. Three examples are shown in Figures 9 to 11.

In Figure 9 the seal in the cavity defined by the skirt 20 is provided with honeycomb shaped partitions thereby forming a multiplicity of suckers 23. In Figures 10 and 11 the seal is provided with a multiplicity of convex cavities thereby defining mini or micro suction pads 24 and 25 respectively. The micro suckers are particularly suitable for adhesion to emulsion painted walls or to wooden doors.

The embodiment illustrated in Figure 12 is moulded to provide a sucker within a sucker in that there is an additional skirt seal 26 provided within a main skirt seal 27. With such an arrangement some suction is maintained even if the sealing by one of the skirts fails.

There are several ways in which suction can be

enhanced by for example increasing the size of cavity from which air can be expelled. One such arrangement is shown in Figure 13. In this case the support is moulded from a resilient material such that a flexible wall 28 of substantially constant thickness defines the shape of the support and a similar shaped cavity. Optional reinforcing strips 29 between walls of the skirt may be provided to reduce excessive splay of the walls.

Another possible construction of the skirt portion is shown in Figure 14. In this embodiment a suction cavity 30 between the skirts 31 has a moulded in spring like portion 32 which encloses a sealed cavity 33. The intention of this spring like element is to exert an enhanced retroactive force after depression of the support element on the surface to increase the suction effect and improve securement to the surface. It will be appreciated that alternative spring means could be employed e.g. a coil spring or a resilient block. This embodiment employs another sealing refinement of the invention which may be employed with any of the embodiments described. This refinement consists of providing one or more slits 34 in the base of the skirt which extend around the periphery of the, or each, suction chamber thereby providing a plurality of individual seal portions around the chamber. Such an arrangement has a similar effect to the ribs in the embodiment of Figures 4 and 5.

The panel support device of Figures 15 and 16 is similar to that of Figures 1 to 3 except that a channel 40

is provided through the wall of the device which communicates with the suction cavity 41. The channel is provided with a non return valve which comprises a ball 42 which cooperates with a tapered seat 43 formed by the wall of the channel near the outer surface. The ball is urged into sealing contact with the seat under the action of a spring 44 and is retained by means of a grill 45. The provision of the valve permits air to be easily expelled from the cavity and allows almost complete expulsion of air or permits the skirt to be made to require greater force to deform it against its natural resilience and thereby allow a greater suction to develop due to the higher retroactive force that natural resilience provides. It will be appreciated that any suitable non return valve could be employed instead of the ball valve e.g. a flap valve or a tyre inflation valve. In addition the valve may be provided with a pressure release capability. One way of providing such a release would be by modifying the arrangement of Figure 16 and using a ball ended rod, instead of the ball 43, to provide the seal. The extremity of the rod could project through the grill 45 to permit withdrawal against the spring force and opening of the channel 40.

The principle of operation of yet another panel support device is illustrated in Figures 17a to 17c. In this construction shown in exploded view at (c) a piston 46 is slidable in a cylinder 47 and induces suction through an aperture 48 in a cup shaped recess 49. The recess is surrounded by a projecting flange 50 on to which there is

fitted a chamber cap 51, formed of a robust but flexible material, as shown in Figure 17b. The cap forms a closure for the recess and seals the recess. A face pad 54 of highly resilient material e.g. silicon rubber is bonded to the cap

5 51 and extends outwardly over the edges of the hole 53 to provide the assembly shown in Figure 17b shown with the piston 46 at the bottom of the cylinder. There is also shown display sheet or board 52 of thickness equal to the projection of the flange 50 to illustrate the alternative

10 capability of supporting of a sheet or panel against a surface. In use the assembly is placed against a surface 55 and the piston is moved upwardly as shown in Figure 17c and is secured by any suitable means to induce a suction in the cup 49 which causes inward deformation of the cap 51 and the

15 face pad 54 and effects adhesion to the surface. The suction induced in the cup shaped recess may be as a result of withdrawal of air but alternatively the assembly may be filled with a hydraulic liquid. The use of a cap of robust yet flexible material permits a large reduction of pressure

20 to induce considerable deformation of the cap without collapse and also sealing of the pressure cavity whilst the use of a more resilient pad 54 provides an enhancement of conformity to surface imperfections and improved seal to the surface. Instead of providing a pad 54 the cap may be

25 provided with a coating, or peripheral rim, of highly resilient material such as silicon rubber, which may be set or non setting, and in which case the spacer 52 may be dispensed with.

The principle illustrated in Figure 17 in connection with a single sucker can be applied to a plurality of suckers each controlled by a single piston. An arrangement having multiple suckers is illustrated in Figures 18 and 19 as is one mechanism for displacing and securing the piston in position in the cylinder to induce suction. The mechanism comprises a lever 56 pivotally connected to the housing 57 at 58 and pivotally connected to the piston at 59. Such a mechanism may be employed with a single or any number of suckers. In the arrangement as illustrated in Figure 18 and 19 the same reference numerals have been employed to identify parts similar to those in Figure 17. Several suckers, formed by cup shaped recesses 49 and caps 51, are employed and a face pad is provided by single sheet 60 of resilient material common to each sucker and formed of for example silicon rubber. In the drawings the sheet is shown spaced from the suckers for clarity. The face pad is preferably bonded to the caps 51 but may be effective as an unsecured sheet. The drawing of Figure 18 illustrates an exploded view with the piston at the bottom of the cylinder and the lever 56 raised. In use the assembly with the fitted caps is pressed against a surface to which securement is to be effected and the lever is depressed until it is secured by a latch 61 as shown in Figure 19. It will be appreciated that the suction induced by the withdrawal of the piston 46 is communicated to each of the cup shaped recesses 49. Because a cap 51 seals each recess a failure of sealing to a surface by any of the suckers is not

communicated to the common suction path and the remaining suckers still serve to secure the device on a surface. The device can be L shaped with suckers extending along both arms of the "L" or frame shaped with suckers distributed
5 around the frame. Similar to the one sucker device of Figure 17 the resilient pad can be replaced by a resilient coating provided on the face of each cap 51 or around the periphery of each cap. Although the recesses 49 are shown as cup shaped, any other shaping can be employed e.g.
10 rectangular.

Figure 20 illustrates an alternative to the piston 46 of Figures 17 to 19. In this construction a resilient diaphragm 62 of for example synthetic rubber is bonded in the cylinder 47 and is linked by a rod 63 to a suitable
15 mechanism for exerting a distorting pull on the diaphragm to change it from the shape illustrated by solid lines to the shape indicated by dotted lines. The mechanisms may be a lever arrangement such as shown in Figures 18 & 19 linked to the rod 63 at pivot 64. It will be appreciated that suction
20 is induced in a manner similar to that effected by withdrawal of a piston.

Figures 21 and 22 illustrate yet another means for inducing suction which can be employed to provide a panel support device in accordance with the invention. The
25 illustrated embodiment is an L shaped corner piece 86 but the same principles can be employed with the alternative configuration of panel support device described herein. Instead of providing a deep flexible skirt, a relatively

thin flexible seal 87 of for example silicon rubber is provided around the periphery of the device. The seal defines a shallow cavity 88 which communicates via a channel 89 in the body of the device with an elongate suction chamber 90 which is preferably cylindrical. The suction chamber contains a piston 91 which sealingly cooperates with the cylindrical suction chamber and which has an operating rod 92 which extends through the wall of the device via a sealing "O" ring 93, and has a handle 94. The inner end of the cylinder is provided with an inlet/outlet for air which communicates between the cylinder and the outer surface of the device. In use, the piston is drawn by the operating rod to the left, as viewed in Figure 22, the support device is held firmly with the seal 87 against a surface to which it is to be secured and the piston is then forced by means of the handle to the right, as viewed in Figure 22, to introduce a suction in the cavity 88. A releasable locking mechanism (not shown) is provided which secures the piston in the suction position. Any suitable means may be employed for example a twist and lock arrangement on the operating rod or a latch mechanism formed by cooperating elements on the rod and on the body of the device. This arrangement has the capacity for producing very high suction and adhesion to a surface and is easily releasable by withdrawal of the operating rod after release of the locking mechanism.

The panel support device illustrated in Figures 22 and 24 employs a slit 95 instead of a groove 10 and this is intended to receive the edge of a sheet of paper the

arrangement being such that the sheet is gripped by the sides of the slit due to resilient clamping. The slit formation can be employed instead of a groove in any of the constructions described herein.

- 5 Figures 25 and 26 illustrate an elongate panel support device which as shown employs a slit 98 which extends along one side for receiving the edge of a sheet of paper the arrangement being such that the sheet is gripped by the sides of the slit due to resilient clamping.
- 10 Alternatively a groove may be substituted for the slit. Similar to the previously described embodiments the device has a skirt 99 with optional partitions 100 to define a plurality of cavities 101. Alternatively suction may be provided by any of the alternative constructions described
- 15 herein. This elongate form of panel support device is intended for positioning along the edge of a panel and may be provided intermediate of adjacent edges of a rectangular panel or sheet. A rectangular panel can be supported by four such devices or by four corner support devices and one or
- 20 more elongate devices. In the case of a slit it is also possible to hang a sheet of paper or thin card by means of a single support device.

 The invention also extends to a panel support device in the form of a complete frame such as is shown in Figure

25 27. Here a frame 102 has outer and inner peripheral skirts 103 & 104 which define therebetween a suction cavity which may be optionally subdivided into a number of individual suction cavities 105 by partitions 106. Alternatively

suction can be provided by any of the arrangements described herein. The inner skirt can be dispensed with if the frame is sealed to a panel so that the panel can be secured to a surface by depressing the entire frame again to the surface, the peripheral skirt acting like a large sucker. Similarly, the inner skirt can be dispensed with if the vacuum producing system described in connection with Figures 17 to 21 is employed as the area within the frame acts as one large cavity. Although the panel is shown to be rectangular it will be appreciated that different shapes of panel and framework can be produced employing the invention.

Referring now to Figures 28 to 32 there is illustrated a particularly advantageous construction which operates in a manner similar to that of Figure 18 & 19 but which does not employ caps. This device has a moulded or machined body 110 formed for example for a plastics or a metal in "L" shape configuration. Each arm of the "L" is provided with one or more suction cavities 111. A cylinder 112 and co-operating piston 113 is provided in each arm of the "L" shape body and the piston is provided with a sealing ring 114 of for example resilient material such as synthetic rubber. The cylinder is linked by a passageway 115 to each of the cavities 111 in the arm of the "L" shaped body. An actuating lever 116 for each piston is mounted on the body by a pivot 117. One end 118 of the lever is shaped to engage one end of the piston and to effect a locking action of the piston at one end of the cylinder where the lever is brought into an operated and stowed position as illustrated

in Figure 31. The other end of the lever extends to the opposite side of the pivot end is for hand actuation. A sheet 119 of a resilient sealing material is provided which extends over the cavities of each arm. The sheet may be "L" shaped to conform to the body or two strips may be employed one for each arm or individual sheet portions may be employed for each cavity. The sheet/sheet portions may be loose or may be bonded over the cavity/cavities. In use the device is pressed onto a surface with the levers in the position illustrated by broken lines in Figure 31. The levers are then moved in the direction of the arrow X in Figure 31 which causes the piston to be moved along the cylinder to the locked position which induces suction in each of the cavities. This causes the resilient sealing material 119 to be sucked inwardly of the cavities and causes the body to be secured on the surface by suction. The resilient sealing material provides a perimeter seal around each cavity. If the seal between the surface and the resilient material relating to one of the cavities fails then so long as the seal between the resilient material and the cavity is maintained then the suction in the remaining cavities is still present and effective to retain securement to the surface. Although the construction illustrated employs two piston/cylinders a single piston with cylinder linked to cavities in each of the arms could be employed. It will be appreciated that bonding of the resilient sheet material to the body around each cavity further enhances the resistance to leakage in the cavity. Furthermore in the

case of such bonding a hydraulic liquid can be provided in the cylinders and cavity instead of air to provide enhanced suction.

The construction of Figures 28 to 32 is formed to receive the corner of a panel in that it is provided with cooperating "L" shaped jaws 120, 121 on the inner faces of the "L". One jaw 121 is resiliently bias towards the other jaw 120 by means of a spring 122 so as to grip a sheet or panel therebetween. The jaw 121 is provided with a projection in the form of a press button 123 which extends from the front face of the "L" adjacent the corner. Pressing of the button cause the jaw 121 to be moved away from the jaw 120 against spring pressure to permit accommodation of sheets or panels of different thicknesses. This resilient jaw action is applicable also to elongate type panel securing devices and can be employed as modifications to any of the panel securing devices described herein. The principles employed in Figures 28 to 32 can of course be employed for elongate shaped and frame shaped panel support devices.

The use of a resilient sheet or cover, of for example silicon rubber, between the suction cavity and the surface to which the panel support device is to be secured can be employed with any of the constructions described herein to provide enhanced adhesion and resilience to vacuum reduction in the sucker. Even with a simple sucker cup enhancement of sealing can result because the resilient sheet is of softer material than the deformable sucker cup

and so conforms to the surface to which the device is to be secured and also due to the resilience makes even better contact with the rim of the sucker. Panel support devices described herein and so modified are considered to fall
5 within the scope of the invention.

It will be appreciated that the overall cross sectional appearance of the devices can be made to exhibit any required ornate appearance and some examples are shown in Figures 33 a to i.

10 The invention also includes a panel display apparatus employing panel support devices as previously described and some examples of such apparatus are shown in Figures 34 to 37.

In Figure 34 a rectangular panel 130 is supported by
15 four "L" shaped panel supported device 131 provided one at each corner.

In Figure 35 a rectangular panel 130 is supported by four elongate panel support devices 132 provided one on each edge intermediately of adjacent edges.

20 In Figure 36 a rectangular panel 130 is supported by four "L" shaped panel support devices 131 provided one at each corner and also by four elongate panel support devices 132 provided one on each edge intermediately of adjacent edges. Such an arrangement can of course support heavier
25 panels or provide improved support against distortion of the panel than in the case of the arrangements of Figures 34 and 35.

In Figure 37 a rectangular panel 130 is supported by

a frame shaped panel support device 133.

The arrangement is suitable for supporting many different types of panels for use in for example advertising or display. Typical applications are in Estate Agents
5 windows, shops, commercial buildings and in the home. The invention permits display by securement to the inside of a window for viewing outside or alternatively for viewing in front of the surface to which the board is attached. The panel may comprise two perspex or glass sheets face to face
10 for receiving posters, prints or cards therebetween.

CLAIMS:

1. A panel support device comprising a support element having means for enabling securement to a surface by suction, which element is formed to receive the edge of a
5 panel.

2. A device as claimed in claim 1 of elongate shape having an elongate formation to receive the edge of a panel.

3. A device as claimed in claim 1, having an "L" shaped formation for receiving the corner of a rectangular
10 panel.

4. A device as claimed in claim 3 which is itself corner shaped.

5. A device as claimed in claim 4, wherein the corner shape is rounded.

15 6. A device as claimed in claim 4, wherein the corner shape is "L" shaped.

7. A device as claimed in claim 5 or 6 wherein the formation to receive the edge of the panel extends along both arms of the corner or "L".

20 8. A device as claimed in claim 1 in the form of a frame for surrounding and securing a panel.

9. A device as claimed in any one of claims 2 to 9, wherein the formation is a groove or a slit into which the edge of a panel can be inserted.

25 10. A device as claimed in claim 9, wherein the walls of the slit or groove are resilient to permit securement of a panel therebetween by a resilient clamping action.

11. A device as claimed in any one of claims 2 to 9, wherein the formation is a projecting web enabling retention of a panel between the web and a surface.

12. A device as claimed in claim 11, wherein the web is resilient to permit securement of a panel between a surface and the web by a resilient clamping action.

13. A device as claimed in any one of claims 2 to 9, wherein the means for securement comprises one or more resilient suckers.

14. A device as claimed in claim 13, wherein a resilient wall is provided defining the perimeter of the element and forming a rectangular or an "L" shaped sucker.

15. A device as claimed in claim 8, or any one of claims 9 to 13 when dependent directly or indirectly from claim 8, wherein a resilient wall is provided both along the outer perimeter and along the inner perimeter of the frame to form a sucker therebetween.

16. A device as claimed in claim 14 or 15, wherein the rectangular, "L" shaped or frame shaped sucker may be provided with one or more resilient partitions thereby to define a plurality of suckers within perimeter or perimeters of the element.

17. A device as claimed in any one of claims 14 to 16, wherein the resilient wall and where provided the partitions, is provided with a sealing surface formed from silicon rubber.

18. A device as claimed in claim 17, wherein the entire resilient wall/partitioning is formed from silicon

rubber.

19. A device as claimed in any one of claims 13 to 18, provided with a non return valve communicating with the sucker cavity of the or at least one of the suckers which
5 permits expulsion of air from the or each cavity but which prevents return therethrough.

20. A device as claimed in claim 19, wherein the valve is provided with opening means to permit return of air to the or said at least one of the suction cavities.

10 21. A device as claimed in any one of claims 1 to 12, provided with one or more rigid or semi-rigid walls to define a suction cavity there being provided a passageway communicating through the element to the cavity and a non return valve in the passageway permitting in use the
15 extraction of air from the cavity.

22. A device as claimed in any one of claims 1 to 12 provided with one or more suction cavities having a peripheral sealing surface and means for inducing a suction in the cavity thereby to secure the device to a surface.

20 23. A device as claimed in claim 22, wherein the peripheral sealing surface is formed by a layer of a highly resilient material.

24. A device as claimed in claim 22, wherein the or each suction cavity is provided with a projecting flange to
25 which there is fitted a chamber cap formed of a resilient material which is deformable inwardly of the cavity by suction.

25. A device as claimed in claim 24, wherein the cap

25

is provided with a peripheral rim of material more resilient than the cap for enhancing conformity to imperfections of the surface and improved seal.

26. A device as claimed in claim 24, wherein the
5 cap is provided with a face pad of material more resilient than the cap for enhancing conformity to imperfection of the surface and improve seal.

27. A device as claimed in claim 26, wherein the face pad is bonded to the cap.

10 28. A device as claimed in claim 25, 26 or 27, wherein the peripheral rim or face pad is silicon rubber.

29. A device as claimed in any one of claims 24 to 28, wherein the or each cavity contains a hydraulic fluid.

30. A device as claimed in any one of claims 22 to
15 29, comprising a cylinder coupled with the or each cavity and containing a piston displaceable therein to induce suction in each cavity.

31. A device as claimed in claim 30 wherein there are a plurality of cylinder and piston devices each cylinder
20 of which is coupled with one or more individual cavities.

32. A device as claimed in claim 30 or 31, comprising for the or each piston/cylinder a mechanism actuatable to displace the piston between two positions to induce or release suction in the or each cavity.

25 33. A device as claimed in any one of claims 22 to 29, comprising a resilient diaphragm which closes a path to the or each cavity which diaphragm is distortable to induce suction in each cavity.

34. A device as claimed in claim 33, comprising a mechanism actuatable to effect distortion of the diaphragm between an actuated and release position to induce and release suction respectively.

5 35. A device as claimed in claim 32 or 34, wherein the mechanism comprises a lever.

36. A device as claimed in claim 35, wherein the lever is retained in the operated position by means of a latch.

10 37. A device as claimed in any one of claims 1 to 17, wherein there is provided a layer of resilient material for location between the device and surface to which it is to be secured.

38. A device as claimed in any one of the preceding
15 claims, comprising a pair of jaws one of which is resiliently biased towards the other to accommodate and grip different thicknesses of panel.

39. A device as claimed in claim 38, wherein the resilient biased jaw is provided with a projection which
20 permits separation of the jaws against the resilient bias by depression.

40. A panel display apparatus comprising a rectangular panel and four support devices having "L" shaped formations each for receiving a different corner of the
25 panel, which support devices are as claimed in claim 3, or any claim directly or indirectly dependent from claim 3.

41 A panel display apparatus as claimed in claim 40, including one or more elongate support devices, as

claimed in claim 2, or any claim directly or indirectly dependent from claim 2, for engagement intermediate of the corners of the panel.

42. A support device for effecting securement by
5 suction in accordance with the means defined in any one of the preceding claims.

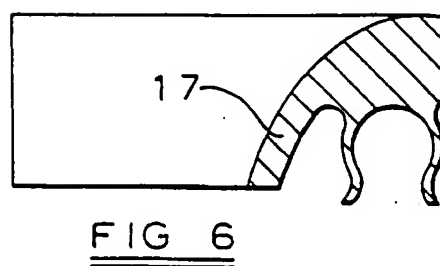
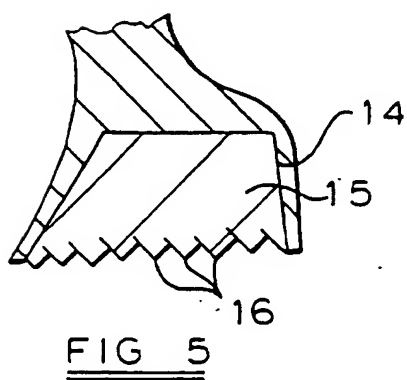
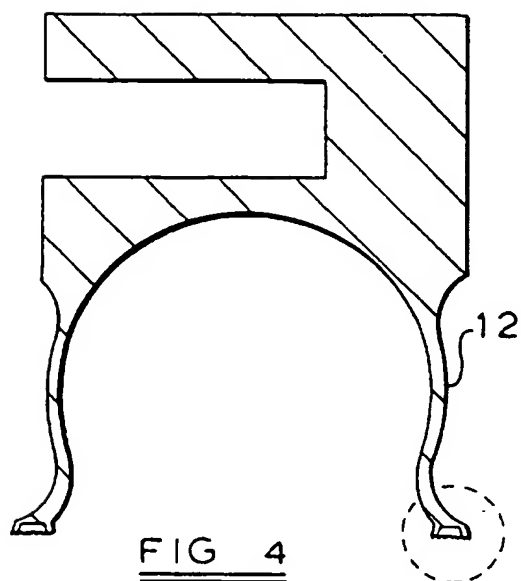
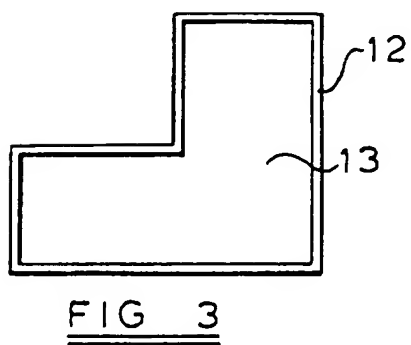
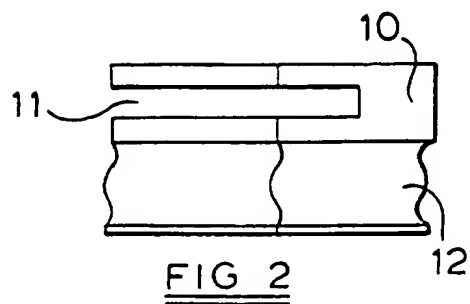
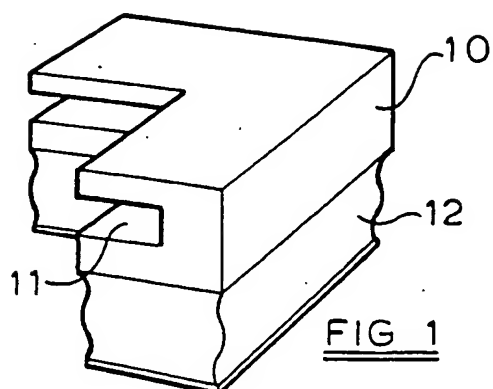


FIG 7

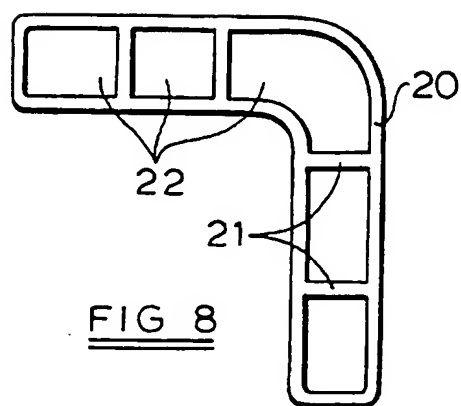
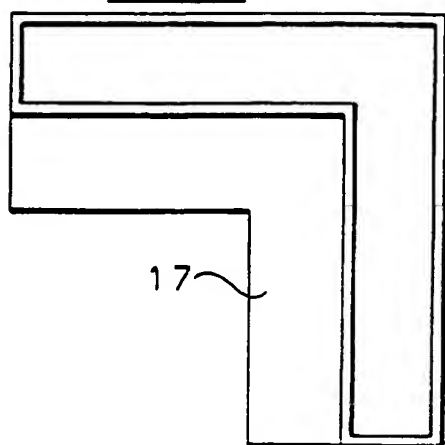


FIG 8

FIG 9

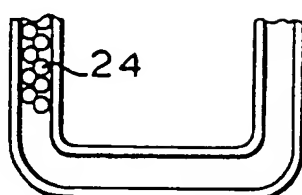
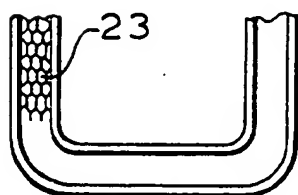


FIG 10

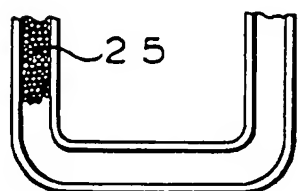


FIG 11

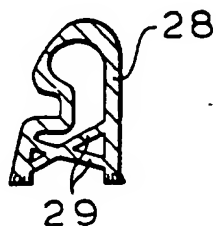


FIG 13

FIG 12

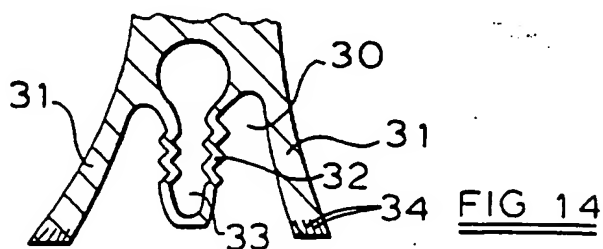
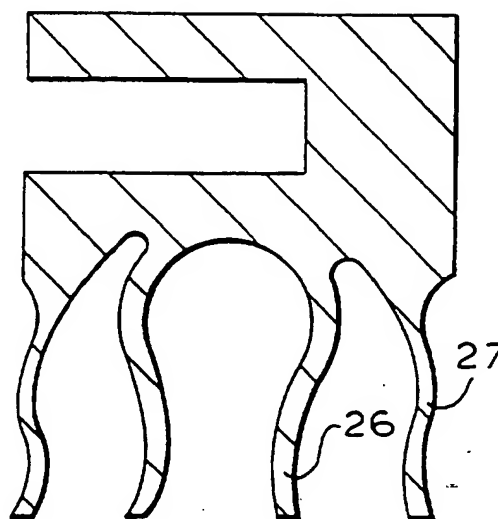


FIG 14

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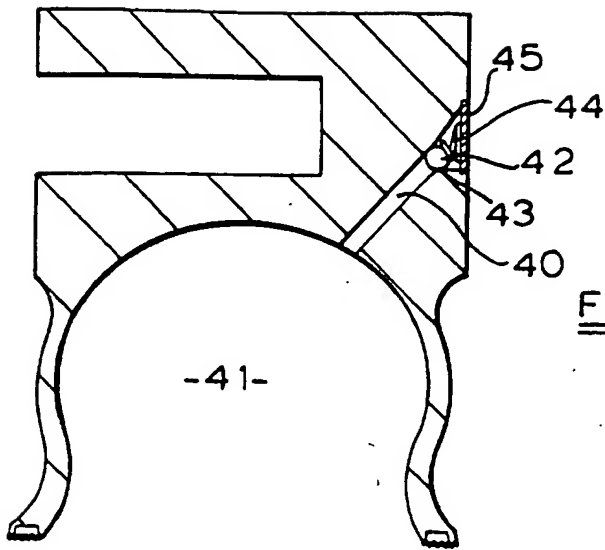


FIG 15

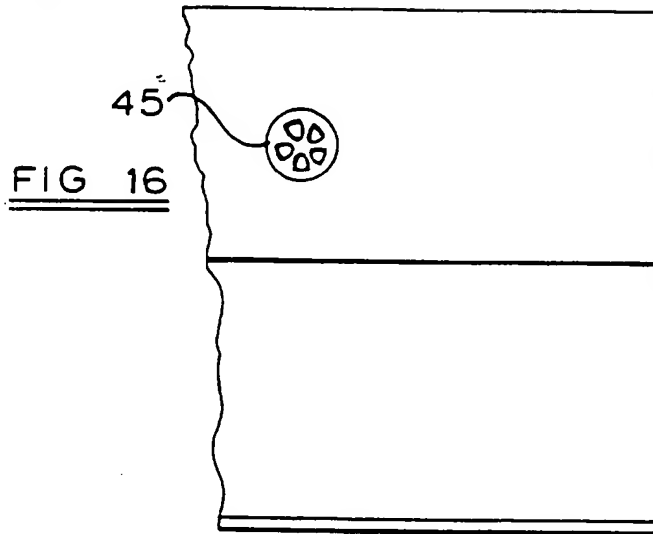


FIG 16

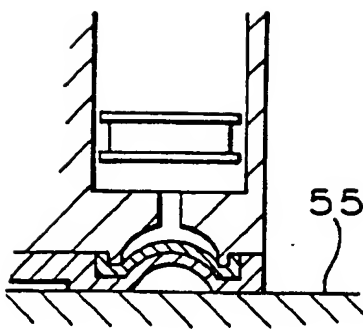


FIG 17a

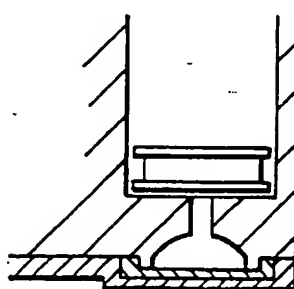


FIG 17b

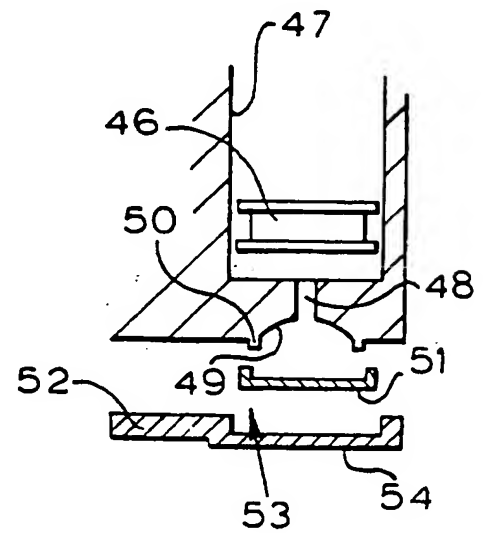
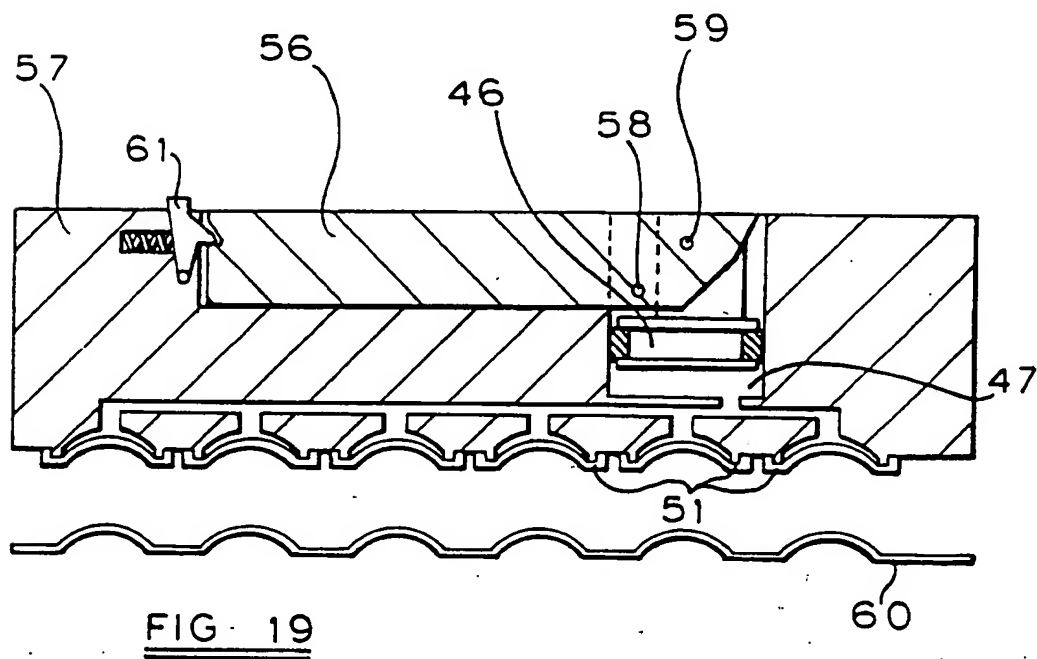
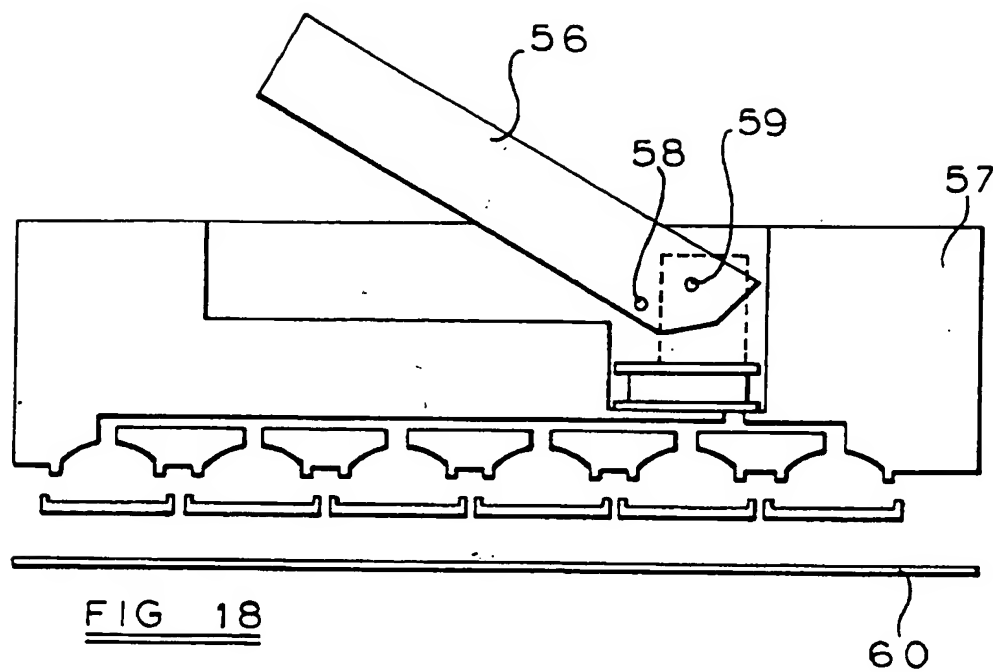
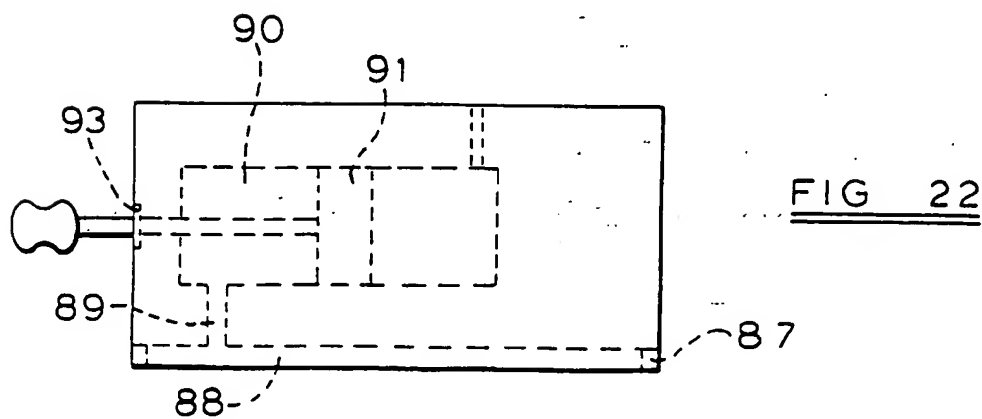
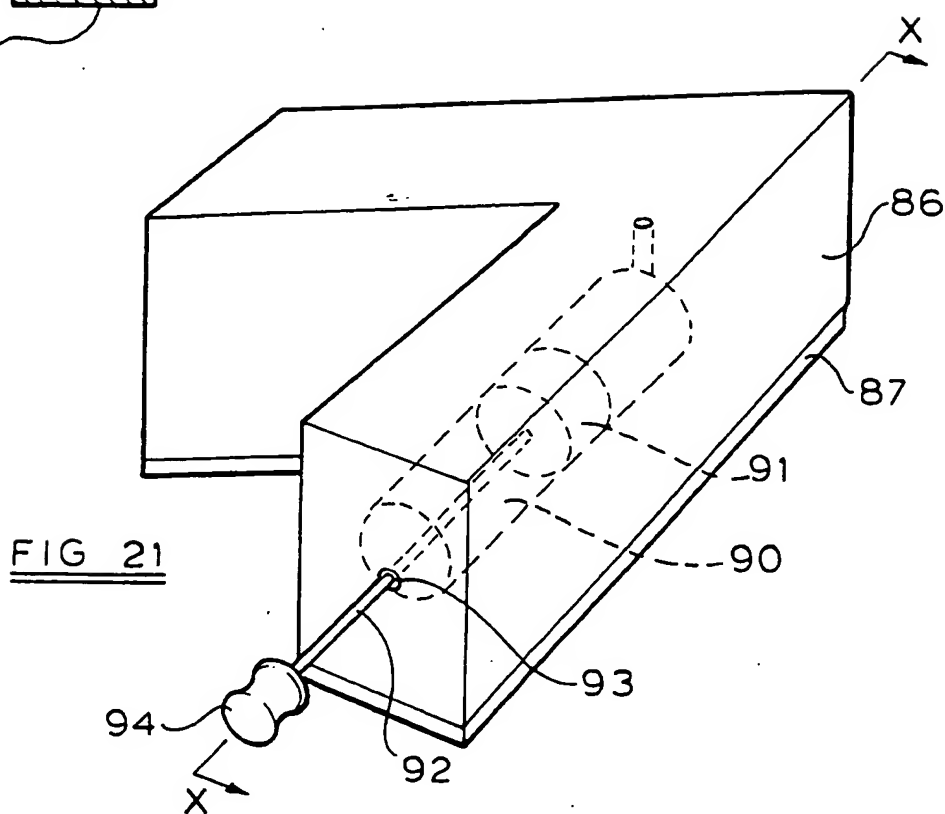
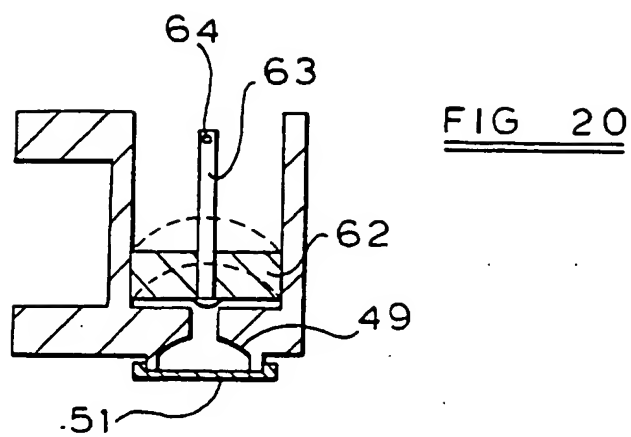


FIG 17c

4 / 8





6 / 8

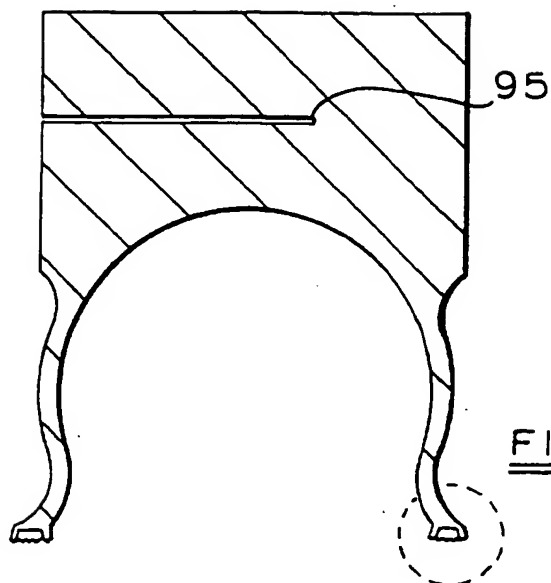


FIG 23

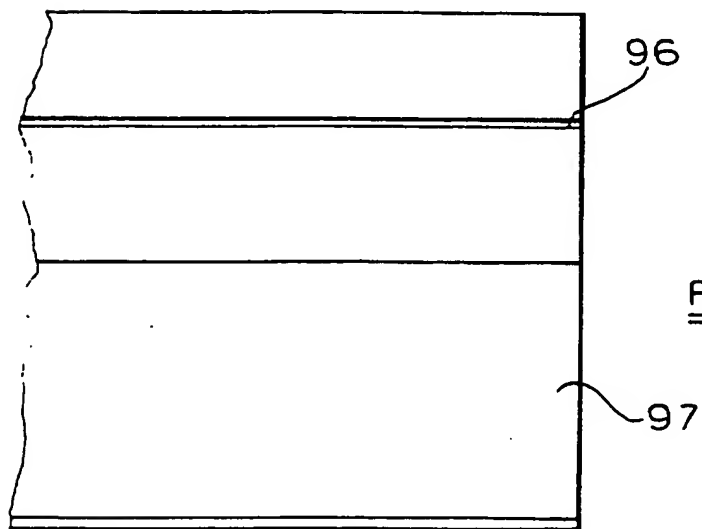


FIG 24

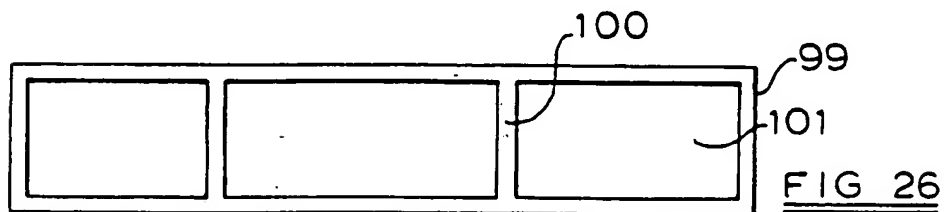


FIG 26

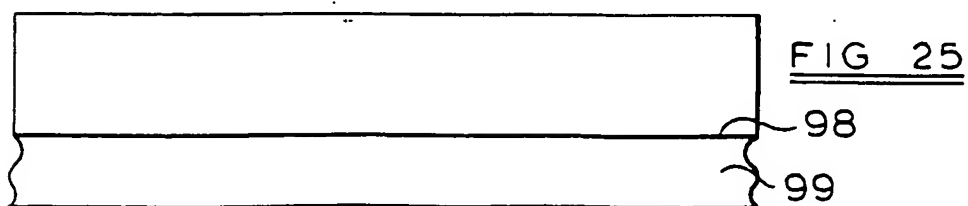


FIG 25

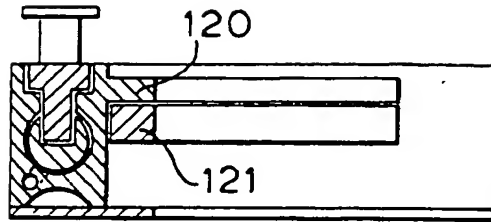


FIG 27

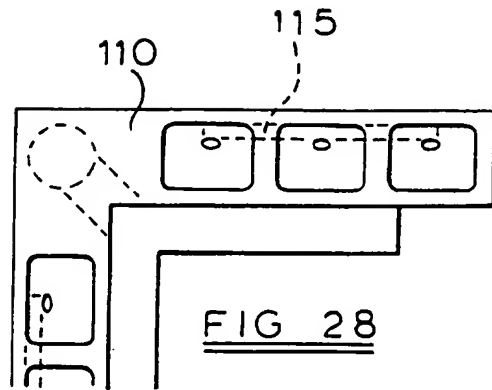


FIG 28

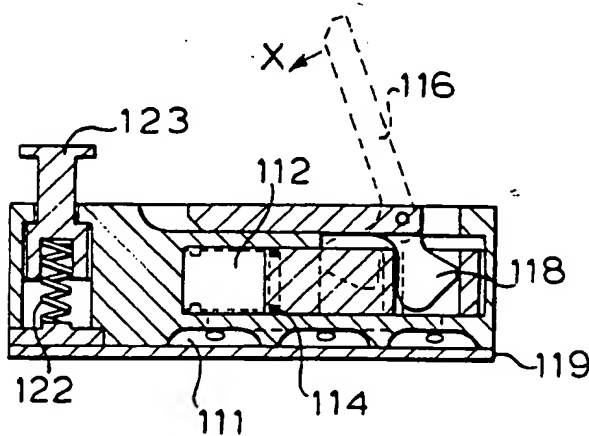


FIG 30

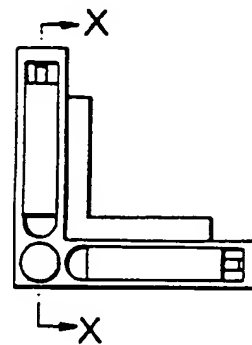


FIG 29

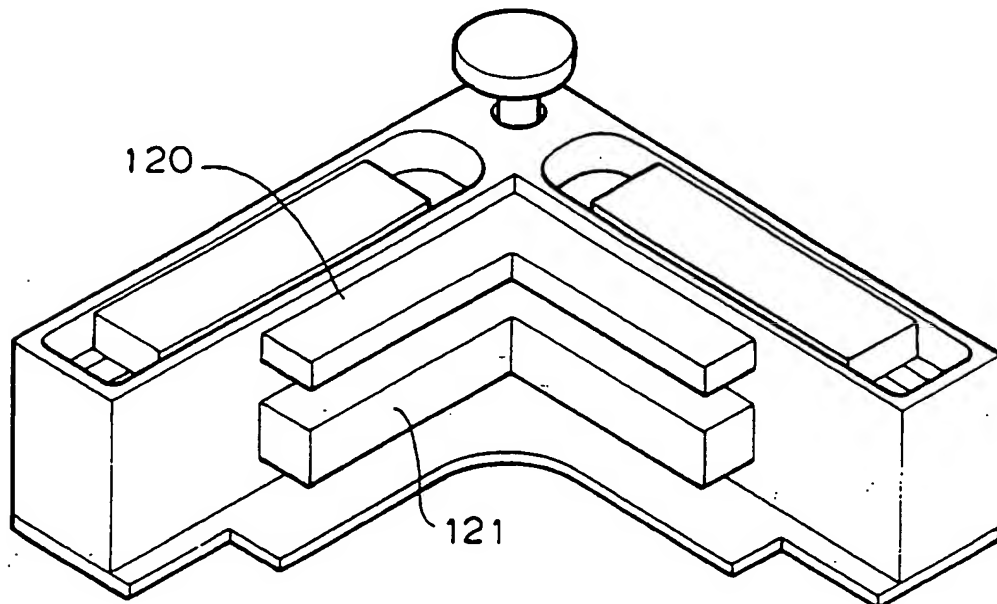


FIG 31

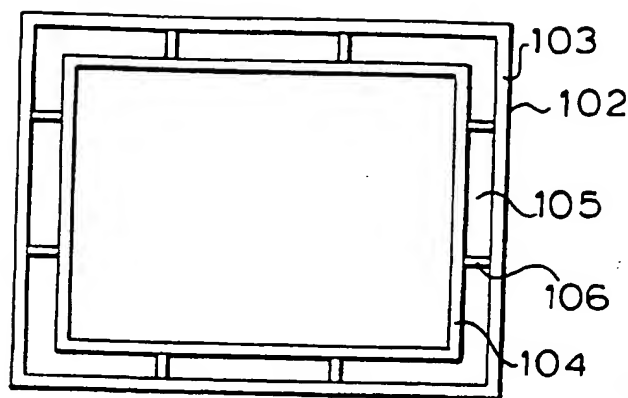


FIG 32

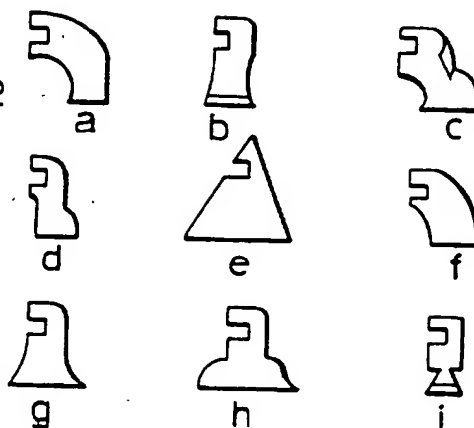


FIG 33

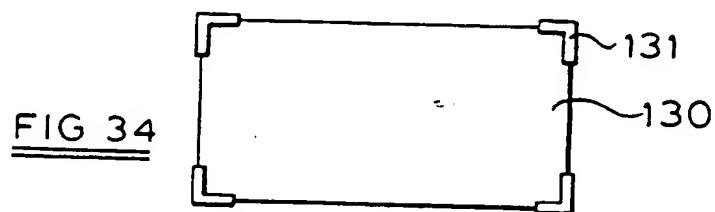


FIG 34

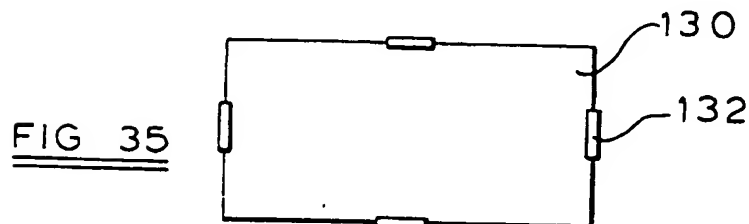


FIG 35

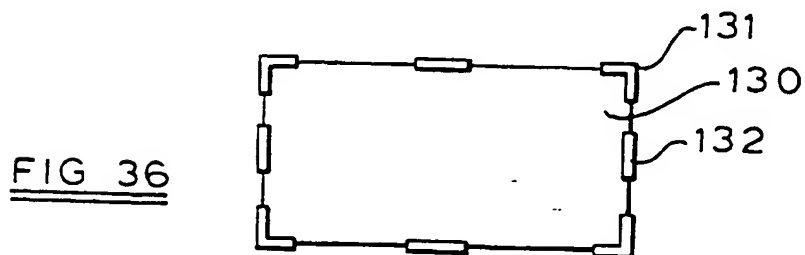


FIG 36

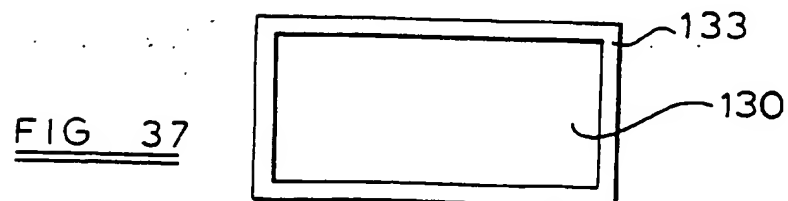


FIG 37

INTERNATIONAL SEARCH REPORT

International Application No
151/GB 96/02273

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 F16B47/00 G09F7/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 F16B G09F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	DATABASE WPI Section PQ, Week 9630 Derwent Publications Ltd., London, GB; Class P85, AN 96-297130 XP002019499 & JP,A,08 129 340 (TSUKADA Y) , 21 May 1996 see abstract	1,2
A	GB,A,2 213 306 (JEWISON RONALD HUBERT;JEWISON NIGEL PHILIP) 9 August 1989 see the whole document	1
A	US,A,5 386 960 (O'BRIEN SHAUGHN F) 7 February 1995 see the whole document	1
	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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- * "O" document referring to an oral disclosure, use, exhibition or other means
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- * "&" document member of the same patent family

Date of the actual completion of the international search

26 November 1996

Date of mailing of the international search report

07.01.97

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Huusom, C

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/GB 96/02273

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,5 430 965 (LAI SHIH-WANG) 11 July 1995 see the whole document ---	1
A	GB,A,2 118 238 (FOON MARION) 26 October 1983 -----	13